Amendments to the Claims:

Please amend the claims, without prejudice, as follows, where underlining identifies added material and strikethroughs identify deleted material (for clarity, the deletion of commas has been highlighted by brackets):

Listing of Claims:

1. (Currently Amended) A hybrid beam deposition system for synthesizing metal oxide films, doped metal oxide films, metal-based oxide alloy films, and doped metal-based oxide alloy films under predetermined synthesis conditions, comprising:

(a) a deposition chamber configured and operative to function as a containment chamber for synthesis of the metal oxide films, doped metal oxide films, metal-based oxide alloy films, and doped metal-based oxide alloy films under the predetermined synthesis conditions;

(b) a target assembly for mounting a metal oxide target material within the deposition chamber;

(c) an rf reactive gas source for introducing an rf oxygen plasma stream into the deposition chamber within a predetermined dynamical pressure range;

(d) a metal oxide plasma generating subsystem configured and operative to interact with the metal oxide target material to generate a high-energy directional metal[~~,~~] oxide plasma plume within the deposition chamber;

(e) a source material subsystem configured and operative, as required, to generate and introduce one or more directed streams of elemental source materials into the deposition chamber for the synthesis of doped metal oxide films, metal-based oxide alloy films, and doped metal-based oxide alloy films; and

(f) a substrate assembly configured and operative to position a substrate having a synthesis surface within the deposition chamber in such manner that the rf oxygen plasma stream, the high-energy directional metal[~~,~~] oxide plasma plume, and the one or more directed streams of elemental source materials optimally are directed in selected combination or sequences at the synthesis surface of the substrate for the synthesis of metal oxide films, doped metal oxide films, metal-based oxide alloy films,

and doped metal-based oxide alloy films on the substrate within the deposition chamber under the predetermined synthesis conditions.

2. (Original) The hybrid beam deposition system of claim 1 further comprising:

(g) a measurement device configured and operative to monitor and determine film thickness in real time of metal oxide films, doped metal oxide films, metal-based oxide alloy films, and doped metal-based oxide alloy films being synthesized on the substrate in the deposition chamber.

3. (Original) The hybrid beam deposition system of claim 1 further comprising:

(h) an evacuation assembly configured and operative to continuously evacuate unused oxygen gas from the deposition chamber during synthesis of metal oxide films, doped metal oxide films, metal-based oxide alloy films, and doped metal-based oxide alloy films.

4. (Original) The hybrid beam deposition system of claim 1 wherein the predetermined dynamical pressure range of the rf oxygen plasma stream introduced into the deposition chamber during synthesis of metal thin films, doped metal oxide films, metal-based oxide alloy films, and doped metal-based oxide alloy films is about $1x10^{-6}$ Torr to about $1x10^{-2}$ Torr.

5. (Original) The hybrid beam deposition system of claim 1 wherein the source material subsystem comprises one or more solid source devices, each of the one or more solid source devices being configured and operative to, using an evaporation process, generate and introduce a directed stream of elemental source material into the deposition chamber for the synthesis of doped metal oxide films, metal-based oxide alloy films, and doped metal-based oxide alloy films.

6. (Original) The hybrid beam deposition system of claim 5 wherein at least one of the solid source devices is a Knudsen-type effusion cell.

7. (Original) The hybrid deposition system of claim 5 wherein at least one of the solid source devices is an E-beam cell.

8. (Original) The hybrid beam deposition system of claim 1 wherein the source materials subsystem comprises at least one gas/chemical vapor deposition apparatus configured and operative to generate and introduce at least one directed stream of gaseous source material into the deposition chamber.

9. (Currently Amended) A hybrid beam deposition method for synthesizing metal oxide films and metal-based oxide alloy films, comprising the steps of:

(a) preparing a substrate having a synthesis surface for film synthesis;

(b) treating the substrate by directing ~~an~~ a first rf oxygen plasma stream at the synthesis surface of the substrate under predetermined treatment conditions that include a predetermined dynamical pressure for the rf oxygen plasma stream;

(c) stabilizing the substrate at a predetermined synthesis temperature;

(d) implementing film synthesis on the synthesis surface of the substrate by activating and operating a metal oxide plasma generating subsystem that is configured and operative to interact with a metal oxide target material to generate and direct a high-energy metal[~~,~~] oxide plasma plume at the synthesis surface of the substrate under predetermined synthesis conditions;

(e) terminating film synthesis once a predetermined synthesis parameter has been achieved by deactivating the metal oxide plasma generating subsystem;

(f) treating the film synthesized on the substrate by directing ~~the~~ a second rf oxygen plasma stream at the synthesized film for a predetermined treatment period at a predetermined dynamical pressure;

(g) decreasing, upon elapse of the predetermined treatment period, the substrate temperature at a predetermined rate of change to stabilize the substrate at room temperature; and

(h) terminating the second rf oxygen plasma stream once the temperature of the substrate has been stabilized at room temperature;

wherein the film synthesized on the substrate and the substrate in combination define a semiconducting composite structure characterized by the film synthesized on the substrate.

10. (Original) The hybrid beam deposition method of claim 9 wherein the film synthesized on the substrate is a metal oxide film such that the semiconducting composite structure synthesized by the hybrid beam deposition method is a metal oxide semiconducting composite structure.

11. (Original) The hybrid beam deposition method of claim 10 wherein the metal oxide target material is polycrystalline ZnO such that the metal oxide film synthesized on the substrate is a ZnO film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is a ZnO semiconducting composite structure.

12. (Original) The hybrid beam deposition method of claim 9 further comprising the step of:

(d1) operating a source material subsystem to generate and direct a directed stream of an elemental source material at the synthesis surface of the substrate such that the film synthesized on the substrate is a metal-based oxide alloy film; and wherein

the semiconducting composite structure synthesized by the hybrid beam deposition method is a metal-based oxide alloy semiconducting composite structure.

13. (Original) The hybrid beam deposition method of claim 12 wherein the metal oxide target material is polycrystalline ZnO such that the metal-based oxide film synthesized on the substrate is a ZnO-based alloy film; and wherein

the semiconducting composite structure synthesized by the hybrid beam deposition method is a ZnO-based alloy semiconducting composite structure.

14. (Original) The hybrid beam deposition method of claim 13 wherein the source material of the source material subsystem is a binary compound selected from a group of binary compounds consisting of BeO, MgO, CaO, SrO, BaO, CdO, HgO, ZnS, ZnSe, ZnTe, CdTe, CdS, CdSe, MgSe, and MgTe to modulate the bandgap of the ZnO-based alloy film being synthesized.

15. (Original) The hybrid beam deposition method of claim 12 wherein the source material of the source material subsystem is a quaternary compound selected from a group of quaternary compounds consisting of ZnCdOSe and ZnCdOS to modulate the bandgap of the ZnO-based alloy film being synthesized.

16. (Original) The hybrid beam deposition method of claim 9 wherein the predetermined dynamical pressure for the rf oxygen plasma stream is within a range of about 1×10^{-6} Torr to about 1×10^{-2} Torr.

17. (Original) The hybrid beam deposition method of claim 9 wherein the predetermined synthesis parameter is a predetermined period of time.

18. (Original) The hybrid beam deposition method of claim 9 wherein the predetermined synthesis parameter is a predetermined thickness for the film being synthesized.

19. (Original) The hybrid beam deposition method of claim 10 further comprising the step of:

(i) adhering ohmic contacts to the metal oxide semiconducting composite structure to form a metal oxide semiconductor device.

20. (Original) A metal oxide semiconductor device produced according to the process of claim 19.

21. (Original) The hybrid beam deposition method of claim 11 further comprising the step of:

(i) adhering ohmic contacts to the ZnO semiconducting composite structure to form a ZnO semiconductor device.

22. (Original) A ZnO semiconductor device produced according to the method of claim 21.

23. (Original) The hybrid beam deposition method of claim 12 further comprising the step of:

(i) adhering ohmic contacts to the metal-based oxide alloy semiconducting composite structure to form a metal-based oxide alloy semiconductor device.

24. (Original) A metal-based oxide alloy semiconductor device produced according to the method of claim 23.

25. (Original) The hybrid beam deposition method of claim 12 further comprising the step of:

(i) adhering ohmic contacts to the ZnO-based alloy semiconducting composite structure to form a ZnO-based alloy semiconductor device.

26. (Original) A ZnO-based alloy semiconductor device produced according to the method of claim 25.

27. (Currently Amended) A hybrid beam deposition method for synthesizing doped metal oxide and metal-based oxide alloy films, comprising the steps of:

(a) preparing a substrate having a synthesis surface for film synthesis;

(b) treating the substrate by directing ~~an~~ a first rf oxygen plasma stream at the synthesis surface of the substrate under predetermined treatment conditions that include a predetermined dynamical pressure for the rf oxygen plasma stream;

(c) stabilizing the substrate at a predetermined synthesis temperature;

(d) further treating the substrate by directing the rf oxygen plasma stream at the synthesis surface of the substrate at a predetermined dynamical pressure for a predetermined period of time;

(e) implementing film synthesis on the synthesis surface of the substrate by:

(e1) activating and operating a metal oxide plasma generating subsystem that is configured and operative to interact with a metal oxide target material to generate and direct a high-energy metal, oxide plasma plume at the synthesis surface of the substrate under predetermined synthesis conditions; and

(e2) operating a source material subsystem at a synthesis temperature within a predetermined range to generate and direct a directed stream of elemental dopant material at the synthesis surface of the substrate;

such that a doped film is synthesized on the substrate;

(f) terminating doped film synthesis once a predetermined synthesis parameter has been achieved;

(g) treating the doped film synthesized on the substrate by directing ~~the~~ a second rf oxygen plasma stream at the synthesized doped film for a predetermined treatment period at a predetermined dynamical pressure;

(h) decreasing, upon lapse of the predetermined treatment period, the substrate temperature at a predetermined rate of change to stabilize the substrate at room temperature; and

(i) terminating the second rf oxygen plasma stream in the deposition chamber once the substrate has been stabilized at room temperature;

wherein the doped film synthesized on the substrate and the substrate in combination define a semiconducting composite structure characterized by the doped film synthesized on the substrate.

28. (Original) The hybrid beam deposition method of claim 27 wherein the doped film synthesized on the substrate is a doped metal oxide film such that the semiconducting

composite structure synthesized by the hybrid beam deposition method is a doped metal oxide semiconducting composite structure.

29. (Original) The hybrid beam deposition method of claim 28 wherein the metal oxide target material is polycrystalline ZnO such that the doped metal oxide film synthesized on the substrate is a doped ZnO film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is a doped ZnO semiconducting composite structure.

30. (Original) The hybrid beam deposition method of claim 28 wherein the dopant material of the source material subsystem is a p-type dopant such that the doped metal oxide film synthesized on the substrate is a p-type metal oxide film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is a p-type metal oxide semiconducting composite structure.

31. (Original) The hybrid beam deposition method of claim 29 wherein the dopant material of the source material subsystem is a p-type dopant such that the doped ZnO film synthesized on the substrate is a p-type ZnO film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is a p-type ZnO semiconducting composite structure.

32. (Original) The hybrid beam deposition method of claim 28 wherein the dopant material of the source material subsystem is an n-type dopant such that the doped metal oxide film synthesized on the substrate is an n-type metal oxide film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is an n-type metal oxide semiconducting composite structure.

33. (Original) The hybrid beam deposition method of claim 29 wherein the dopant material of the source material subsystem is an n-type dopant such that the doped ZnO film synthesized on the substrate is an n-type ZnO film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is an n-type ZnO semiconducting composite structure.

34. (Original) The hybrid beam deposition method of claim 27 further comprising the step of:

(e3) further operating the source material subsystem at a synthesis temperature within a predetermined range to generate and direct a directed stream of elemental source material at the synthesis surface of the substrate;

wherein the doped film synthesized on the substrate is a doped metal-based oxide alloy film such that the semiconducting composite structure synthesized by the hybrid beam deposition method is a doped metal-based oxide alloy semiconducting composite structure.

35. (Original) The hybrid beam deposition method of claim 34 wherein the metal oxide target material is polycrystalline ZnO such that the doped metal-based oxide alloy film synthesized on the substrate is a doped ZnO-based alloy film; and wherein the semiconducting composite structure is a doped ZnO-based alloy semiconducting composite structure.

36. (Original) The hybrid beam deposition method of claim 35 wherein the source material used by the source material subsystem to generate the directed stream of elemental source material is a binary compound selected from a group of binary compounds consisting of BeO, MgO, CaO, SrO, BaO, CdO, HgO, ZnS, ZnSe, ZnTe, CdTe, CdS, CdSe, MgSe, and MgTe to modulate the bandgap of the ZnO-based alloy film being synthesized.

37. (Original) The hybrid beam deposition method of claim 35 wherein the source material used by the source material subsystem to generate the directed stream of elemental source material is a quaternary compound selected from a group of quaternary compounds consisting of ZnCdOSe and ZnCdOS to modulate the bandgap of the ZnO-based alloy film being synthesized.

38. (Original) The hybrid beam deposition method of claim 34 wherein the dopant material used by the source material subsystem to generate the directed stream of elemental dopant material is a p-type dopant such that the doped metal-based oxide alloy film synthesized on the substrate is a p-type metal-based oxide alloy film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is a p-type metal-based oxide alloy semiconducting composite structure.

39. (Original) The hybrid beam deposition method of claim 35 wherein the dopant material used by the source material subsystem to generate the directed stream of

elemental dopant material is a p-type dopant such that doped ZnO-based alloy film synthesized on the substrate is a p-type ZnO-based alloy film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is a p-type ZnO-based alloy semiconducting composite structure.

40. (Original) The hybrid beam deposition method of claim 34 wherein the dopant material used by the source material subsystem to generate the directed stream of elemental dopant material is an n-type dopant such that the doped metal-based oxide alloy film synthesized on the substrate is an n-type metal-based oxide alloy film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is an n-type metal-based oxide alloy semiconducting composite structure.

41. (Original) The hybrid beam deposition method of claim 35 wherein the dopant material used by the source material subsystem to generate the directed stream of elemental dopant material is an n-type dopant such that doped ZnO-based alloy film synthesized on the substrate is an n-type ZnO-based alloy film; and wherein the semiconducting composite structure synthesized by the hybrid beam deposition method is an n-type ZnO-based alloy semiconducting composite structure.

42. (Original) The hybrid beam deposition method of claim 27 wherein the source material subsystem operating step comprises varying the synthesis temperature of the source material used by the source material subsystem within the predetermined range to vary the concentration of the directed stream of elemental dopant material such that the carrier concentration of the doped film synthesized on the substrate is varied.

43. (Original) The hybrid beam deposition method of claim 27 wherein the predetermined dynamical pressure for the rf oxygen plasma stream is within a range of about $1x10^{-6}$ Torr to about $1x10^{-2}$ Torr.

44. (Original) The hybrid beam deposition method of claim 28 further comprising the step of:

(j) adhering ohmic contacts to the doped metal oxide semiconducting composite structure to form a doped metal oxide semiconductor device.

45. (Original) A doped metal oxide semiconductor device produced according to the method of claim 44.

46. (Original) The hybrid beam deposition method of claim 29 further comprising the step of:

(j) adhering ohmic contacts to the doped ZnO semiconducting composite structure to form a doped ZnO semiconductor device.

47. (Original) A doped ZnO semiconductor device produced according to the method of claim 46.

48. (Original) The hybrid beam deposition method of claim 30 further comprising the step of:

(j) adhering ohmic contacts to the p-type metal oxide semiconducting composite structure to form a p-type metal oxide semiconductor device.

49. (Original) A p-type metal oxide semiconductor device produced according to the method of claim 48.

50. (Original) The hybrid beam deposition method of claim 31 further comprising the step of:

(j) adhering ohmic contacts to the p-type ZnO semiconducting composite structure to form a p-type ZnO semiconductor device.

51. (Original) A p-type ZnO semiconductor device produced according to the method of claim 50.

52. (Original) The hybrid beam deposition method of claim 32 further comprising the step of:

(j) adhering ohmic contacts to the n-type metal oxide semiconducting composite structure to form an n-type metal oxide semiconductor device.

53. (Original) An n-type metal oxide semiconductor device produced according to the method of claim 52.

54. (Original) The hybrid beam deposition method of claim 33 further comprising the step of:

(j) adhering ohmic contacts to the n-type ZnO semiconducting composite structure to form an n-type ZnO semiconductor device.

55. (Original) An n-type ZnO semiconductor device produced according to the method of claim 54.

56. (Original) The hybrid beam deposition method of claim 34 further comprising the step of:

(j) adhering ohmic contacts to the doped metal-based oxide alloy semiconducting composite structure to form a doped metal-based oxide alloy semiconductor device.

57. (Original) A doped metal-based oxide alloy semiconductor device produced according to the method of claim 54.

58. (Original) The hybrid beam deposition method of claim 35 further comprising the step of:

(j) adhering ohmic contacts to the doped ZnO-based alloy semiconducting composite structure to form a doped ZnO-based alloy semiconductor device.

59. (Original) A doped ZnO-based alloy semiconductor device produced according to the method of claim 58.

60. (Original) The hybrid beam deposition method of claim 38 further comprising the step of:

(j) adhering ohmic contacts to the p-type metal-based oxide alloy semiconducting composite structure to form a p-type metal-based oxide alloy semiconductor device.

61. (Original) A p-type metal-based oxide alloy semiconductor device produced according to the method of claim 60.

62. (Original) The hybrid beam deposition method of claim 39 further comprising the step of:

(j) adhering ohmic contacts to the p-type ZnO-based alloy semiconducting composite structure to form a p-type ZnO-based alloy semiconductor device.

63. (Original) A p-type ZnO-based alloy semiconductor device produced according to the method of claim 60.

64. (Original) The hybrid beam deposition method of claim 40 further comprising the step of:

(j) adhering ohmic contacts to the n-type metal-based oxide alloy semiconducting composite structure to form an n-type metal-based oxide alloy semiconductor device.

65. (Original) A p-type metal-based oxide alloy semiconductor device produced according to the method of claim 62.

66. (Original) The hybrid beam deposition method of claim 41 further comprising the step of:

(j) adhering ohmic contacts to the n-type ZnO-based alloy semiconducting composite structure to form an n-type ZnO-based alloy semiconductor device.

67. (Original) An n-type ZnO-based alloy semiconductor device produced according to the method of claim 64.

68. (Currently Amended) A hybrid beam deposition method for fabricating a semiconductor device, comprising the steps of:

(a) preparing a substrate layer having a synthesis surface for synthesis of the semiconductor device;

(b) treating the substrate layer by directing ~~an~~ a first rf oxygen plasma stream at the synthesis surface of the substrate layer under predetermined treatment conditions that include a predetermined dynamical pressure for the rf oxygen plasma stream;

(c) stabilizing the substrate layer at a predetermined synthesis temperature;

(d) further treating the substrate layer by directing the rf oxygen plasma stream at the synthesis surface of the substrate layer at a predetermined dynamical pressure for a predetermined period of time;

(e) implementing synthesis of one or more metal oxide film layers on the substrate layer to form a semiconducting composite structure by:

(e1) activating and operating a metal oxide plasma generating subsystem that is configured and operative to interact with a metal oxide target material to generate and direct a high-energy metal, oxide plasma plume at the synthesis surface of the substrate layer under predetermined synthesis conditions,

(e2) operating, as required, a source material subsystem using one or more compatible alloy materials at a synthesis temperature within a predetermined range to generate and direct one or more directed stream of elemental alloy materials at the synthesis surface of the substrate layer, and

(e3) operating, as required, the source material subsystem at a synthesis temperature within a predetermined range to generate and direct a directed stream of dopant source material at the synthesis surface of the substrate layer;

(f) terminating metal oxide film layer synthesis of the semiconducting composite structure once a predetermined synthesis parameter has been achieved by deactivating the metal oxide plasma generating subsystem and, if operating, the source material subsystem;

(g) treating, as required, the synthesized metal oxide film layer of the semiconducting composite structure by directing ~~the~~ a second rf oxygen plasma stream thereat for a predetermined treatment period at a predetermined dynamical pressure;

(h) changing, upon lapse of the predetermined treatment period, the substrate layer temperature of the semiconducting composite structure at a predetermined rate to stabilize the substrate layer at a predetermined temperature for synthesis of an additional metal oxide film layer, if required;

(i) re-executing steps (e), (f), (g), and (h), as required, to synthesize one or more additional metal oxide film layers for the semiconducting composite structure;

(j) decreasing, after formation of the semiconducting composite structure, the substrate layer temperature of the semiconducting composite structure at a predetermined rate of change to stabilize the substrate layer at room temperature;

(i) terminating the second rf oxygen plasma stream directed at the semiconducting composite structure once the substrate layer has been stabilized at room temperature; and

adhering ohmic contacts to the semiconducting composite structure to form the semiconductor device.

69. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an n-type metal oxide material; and wherein

the source material subsystem of step (e3) is operative using a p-type dopant to synthesize a p-type metal oxide film layer on the n-type metal oxide substrate layer to form an N-P metal oxide semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is an N-P metal oxide semiconductor device.

70. (Original) The hybrid beam deposition method of claim 69 wherein

the n-type metal oxide material comprising the substrate layer is an n-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the p-type metal oxide film layer synthesized on the n-type ZnO substrate layer is a p-type ZnO film layer; and wherein the N-P metal oxide semiconducting composite structure is an N-P ZnO semiconducting composite structure and the N-P metal oxide semiconductor device is an N-P ZnO semiconductor device.

71. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an p-type metal oxide material; and wherein

the source material subsystem of step (e3) is operative using an n-type dopant to synthesize an n-type metal oxide film layer on the p-type metal oxide substrate layer to form a P-N metal oxide semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is a P-N metal oxide semiconductor device.

72. (Original) The hybrid beam deposition method of claim 71 wherein

the p-type metal oxide material comprising the substrate layer is a p-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the n-type metal oxide film layer synthesized on the p-type ZnO substrate layer is an n-type ZnO film layer; and wherein the P-N metal oxide semiconducting composite structure is a P-N ZnO semiconducting composite structure and the P-N metal oxide semiconductor device is a P-N ZnO semiconductor device.

73. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an n-type metal oxide material; and wherein

an undoped metal oxide buffer film layer is synthesized on the n-type metal oxide substrate layer by operation of the metal oxide plasma generating subsystem; and wherein

an additional metal oxide film layer is synthesized on the undoped metal oxide buffer film layer by operating the source material subsystem of step (e3) using a p-type dopant to synthesize a p-type metal oxide film layer on the undoped metal oxide buffer film layer to form an N- undoped buffer film layer-P metal oxide semiconducting

composite structure such that the semiconductor device formed by the hybrid beam deposition method is an N- undoped buffer film layer-P metal oxide semiconductor device.

74. (Original) The hybrid beam deposition method of claim 73 wherein the n-type metal oxide material comprising the substrate layer is an n-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the undoped buffer film layer synthesized on the n-type ZnO substrate layer is an undoped ZnO buffer film layer, and the p-type metal oxide film layer synthesized on the undoped ZnO buffer film layer is a p-type ZnO film layer; and such that

the N- undoped buffer film layer-P metal oxide semiconducting composite structure is an N-undoped buffer film layer-P ZnO semiconducting composite structure and the N-undoped buffer film layer-P metal oxide semiconductor device is a N-undoped buffer film layer-P ZnO semiconductor device.

75. (Original) The hybrid beam deposition method of claim 66 wherein

the substrate layer is an n-type metal oxide material; and wherein

the source material subsystem of step (e3) is first operated using a p-type dopant to synthesize a heavily-doped p-type metal oxide active film layer on the n-type metal oxide substrate layer; and wherein

an additional metal oxide film layer is synthesized on the heavily-doped metal oxide active film layer by operating the source material subsystem of step (e3) using a p-type dopant to synthesize a p-type metal oxide film layer on the heavily-doped p-type metal oxide active film layer to form an N-P-P metal oxide semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is an N-P-P metal oxide semiconductor device.

76. (Original) The hybrid beam deposition method of claim 74 wherein the n-type metal oxide material comprising the substrate layer is an n-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the heavily-doped p-type metal oxide active film layer synthesized on the n-type ZnO substrate layer is a heavily-doped p-type ZnO active film layer, and the p-type metal oxide film layer synthesized on the heavily-doped p-type ZnO active film layer is a p-type ZnO film layer; and such that

the N-P-P metal oxide semiconducting composite structure is an N-P-P ZnO semiconducting composite structure and the N-P-P metal oxide semiconductor device is an N-P-P ZnO semiconductor device.

77. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an n-type metal oxide material; and wherein

an undoped metal oxide buffer film layer is synthesized on the n-type metal oxide substrate layer by operation of the metal oxide plasma generating subsystem; and wherein

a first additional metal oxide film layer is synthesized on the metal oxide buffer film layer by operating the source material subsystem of step (e3) using a p-type dopant to synthesize a heavily-doped p-type metal oxide active film layer on the undoped metal oxide buffer film layer; and wherein

a second additional metal oxide film layer is synthesized on the heavily-doped metal oxide active film layer by operating the source material subsystem of step (e3) using a p-type dopant to synthesize a p-type metal oxide film layer on the heavily-doped p-type metal oxide active film layer to form an N-undoped buffer film layer-P-P metal oxide semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is an N-undoped buffer film layer-P-P metal oxide semiconductor device.

78. (Original) The hybrid beam deposition method of claim 77 wherein the n-type metal oxide material comprising the substrate layer is an n-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the undoped metal oxide buffer film layer synthesized on the n-type ZnO substrate layer is an undoped ZnO buffer film layer, the p-type metal oxide active film layer synthesized on the undoped ZnO buffer film layer is a heavily-doped p-type ZnO active film layer, and the p-type metal oxide film layer synthesized on the heavily-doped p-type ZnO active film layer is a p-type ZnO film such that

the N-undoped buffer film layer-P-P metal oxide semiconducting composite structure is an N-undoped buffer film layer-P-P ZnO semiconducting composite structure and the N-undoped buffer film layer-P-P metal oxide semiconductor device is an N-undoped buffer film layer-P-P ZnO semiconductor device.

79. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an n-type metal oxide material; and wherein

the source material subsystem of step (e2) is operative using one or more compatible alloy source materials and the source material subsystem of step (e3) is operative using a p-type dopant to synthesize a p-type metal-based oxide alloy film layer on the n-type metal oxide substrate layer to form an N-P metal-based oxide alloy semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is an N-P metal-based oxide alloy semiconductor device.

80. (Original) The hybrid beam deposition method of claim 79 wherein

the n-type metal oxide material comprising the substrate layer is an n-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the p-type metal-based oxide alloy film layer synthesized on the n-type ZnO substrate layer is a p-type ZnO-based alloy film layer; and wherein the N-P metal-based oxide alloy semiconducting composite structure is an N-P ZnO-based alloy semiconducting composite structure and the N-P metal-based oxide alloy semiconductor device is an N-P ZnO-based alloy semiconductor device.

81. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an p-type metal oxide material; and wherein

the source material subsystem of step (e2) is operative using one or more compatible alloy source materials and the source material subsystem of step (e3) is operative using n n-type dopant to synthesize an n-type metal-based oxide alloy film layer on the p-type metal oxide substrate layer to form a P-N metal-based oxide alloy semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is a P-N metal-based oxide alloy semiconductor device.

82. (Original) The hybrid beam deposition method of claim 81 wherein

the p-type metal oxide material comprising the substrate layer is a p-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the n-type metal-based oxide alloy film layer synthesized on the p-type ZnO substrate layer is an n-type ZnO-based alloy film layer; and wherein the P-N metal-based oxide alloy semiconducting composite structure is a P-N ZnO-based alloy semiconducting composite

structure and the P-N metal-based oxide alloy semiconductor device is a P-N ZnO-based alloy semiconductor device.

83. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an n-type metal oxide material; and wherein

an undoped metal-based oxide alloy buffer film layer is synthesized on the n-type metal oxide substrate layer by operation of the metal oxide plasma generating subsystem and the step (e2) source material subsystem; and wherein

an additional metal-based oxide alloy film layer is synthesized on the undoped metal-based oxide alloy buffer film layer by operating the source material subsystem of step (e2) and operating the source material subsystem of step (e3) using a p-type dopant to synthesize a p-type metal-based oxide alloy film layer on the undoped metal-based oxide alloy buffer film layer to form an N- undoped buffer film layer-P metal-based oxide alloy semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is an N- undoped buffer film layer-P metal-based oxide alloy semiconductor device.

84. (Original) The hybrid beam deposition method of claim 83 wherein the n-type metal oxide material comprising the substrate layer is an n-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the undoped metal-based oxide alloy buffer film layer synthesized on the n-type ZnO substrate layer is an undoped ZnO-based alloy buffer film layer, and the p-type metal-based oxide alloy film layer synthesized on the undoped ZnO-based alloy buffer film layer is a p-type ZnO-based alloy film layer; and such that

the N-undoped buffer film layer-P metal-based oxide alloy semiconducting composite structure is an N-undoped buffer film layer-P ZnO-based alloy semiconducting composite structure and the N-undoped buffer film layer-P metal-based oxide alloy semiconductor device is a N-undoped buffer film layer-P ZnO-based alloy semiconductor device.

85. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an n-type metal oxide material; and wherein

the source material subsystem of step (e2) is operative using one or more compatible alloy source materials and the source material subsystem of step (e3) is

operated using a p-type dopant to synthesize a heavily-doped p-type metal-based oxide alloy active film layer on the n-type metal oxide substrate layer; and wherein

an additional metal-based oxide alloy film layer is synthesized on the heavily-doped metal-based oxide alloy active film layer by operating the source material subsystem of step (e2) using one or more compatible alloy source materials and the source material subsystem of step (e3) using a p-type dopant to synthesize a p-type metal-based oxide alloy film layer on the heavily-doped p-type metal-based oxide alloy active film layer to form an N-P-P metal-based oxide alloy semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is an N-P-P metal-based oxide alloy semiconductor device.

86. (Original) The hybrid beam deposition method of claim 85 wherein the n-type metal oxide material comprising the substrate layer is an n-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the heavily-doped p-type metal-based oxide alloy active film layer synthesized on the n-type ZnO substrate layer is a heavily-doped p-type ZnO-based alloy film layer, and the p-type metal-based oxide alloy film layer synthesized on the heavily-doped p-type ZnO-based alloy active film layer is a p-type ZnO-based alloy film layer; and such that

the N-P-P metal-based oxide alloy semiconducting composite structure is an N-P-P ZnO-based alloy semiconducting composite structure and the N-P-P metal-based oxide alloy semiconductor device is an N-P-P ZnO-based alloy semiconductor device.

87. (Original) The hybrid beam deposition method of claim 68 wherein

the substrate layer is an n-type metal oxide material; and wherein

an undoped metal-based oxide alloy buffer film layer is synthesized on the n-type metal oxide substrate layer by operation of the metal oxide plasma generating subsystem and the step (e2) source material subsystem; and wherein

a first additional metal-based oxide alloy film layer is synthesized on the metal-based oxide alloy buffer film layer by operating the source material subsystem of step (e2) and the source material subsystem of step (e3) using a p-type dopant to synthesize a heavily-doped p-type metal-based oxide alloy active film layer on the undoped metal-based oxide alloy buffer film layer; and wherein

a second additional metal-based oxide alloy film layer is synthesized on the heavily-doped metal-based oxide alloy active film layer by operating the source material subsystem of step (e2) and the source material subsystem of step (e3) using a p-type dopant to synthesize a p-type metal-based oxide alloy film layer on the heavily-doped p-type metal-based oxide alloy active film layer to form an N-undoped buffer film layer-P-P metal-based oxide alloy semiconducting composite structure such that the semiconductor device formed by the hybrid beam deposition method is an N-undoped buffer film layer-P-P metal-based oxide alloy semiconductor device.

88. (Original) The hybrid beam deposition method of claim 87 wherein the n-type metal oxide material comprising the substrate layer is an n-type ZnO; and wherein

the metal oxide target material is a polycrystalline ZnO such that the undoped metal-base oxide alloy buffer film layer synthesized on the n-type ZnO substrate layer is an undoped ZnO-based alloy buffer film layer, the p-type metal-based oxide alloy active film layer synthesized on the undoped ZnO-based alloy buffer film layer is a heavily-doped p-type ZnO-based alloy active film layer, and the p-type metal-based oxide alloy film layer synthesized on the heavily-doped p-type ZnO-based alloy active film layer is a p-type ZnO-based alloy film such that

the N-undoped buffer film layer-P-P metal-based oxide alloy semiconducting composite structure is an N-undoped buffer film layer-P-P ZnO-based alloy semiconducting composite structure and the N-undoped buffer film layer-P-P metal-based oxide alloy semiconductor device is an N-undoped buffer film layer-P-P ZnO-based alloy semiconductor device.

89. (Original) An N-P metal oxide semiconductor device produced according to the process of claim 69.

90. (Original) An N-P ZnO semiconductor device produced according to the process of claim 70.

91. (Original) A P-N metal oxide semiconductor device produced according to the process of claim 71.

92. (Original) A P-N ZnO semiconductor device produced according to the process of claim 72.

93. (Original) An N-undoped buffer film layer-P metal oxide semiconductor device produced according to the process of claim 73.

94. (Original) An N-undoped buffer film layer-P ZnO semiconductor device produced according to the process of claim 74.

95. (Original) An N-P-P metal oxide semiconductor device produced according to the process of claim 75.

96. (Original) An N-P-P ZnO semiconductor device produced according to the process of claim 76.

97. (Original) An N-undoped buffer film layer-P-P metal oxide semiconductor device produced according to the process of claim 77.

98. (Original) An N-undoped buffer film layer-P-P ZnO semiconductor device produced according to the process of claim 78.

99. (Original) An N-P metal-based oxide alloy semiconductor device produced according to the process of claim 79.

100. (Original) An N-P ZnO-based alloy semiconductor device produced according to the process of claim 80.

101. (Original) A P-N metal-based oxide alloy semiconductor device produced according to the process of claim 81.

102. (Original) A P-N ZnO-based alloy semiconductor device produced according to the process of claim 82.

103. (Original) An N-undoped buffer film layer-P metal-based oxide alloy semiconductor device produced according to the process of claim 83.

104. (Original) An N-undoped buffer film layer-P ZnO-based alloy semiconductor device produced according to the process of claim 84.

105. (Original) An N-P-P metal-based oxide alloy semiconductor device produced according to the process of claim 85.

106. (Original) An N-P-P ZnO-based alloy semiconductor device produced according to the process of claim 88.

107. (Original) An N-undoped buffer film layer-P-P metal-based oxide alloy semiconductor device produced according to the process of claim 87.

108. (Original) An N-undoped buffer film layer-P-P ZnO-based alloy semiconductor device produced according to the process of claim 88.

109. (Original) A method of adhering bilayered ohmic contacts to a semiconducting composite structure to form a semiconductor device, the semiconducting composite structure including at least a substrate layer and a carrier-conduction layer, the method comprising the steps of :

(a) patterning a surface of the carrier-conduction layer of the semiconducting composite structure;

(b) etching the patterned surface of carrier-conduction layer to form a mesa surface of carrier-conduction material on the carrier-conduction layer;

(c) patterning the mesa surface of the carrier-conduction layer to form one or more contact sites for the carrier-conduction layer;

(d) adhering a bilayered ohmic contact to at least one of the contact sites of the carrier-conduction layer; and

(e) adhering a bilayered ohmic contact to an exposed surface of the substrate layer to form the semiconductor device.

110. (Original) The method of claim 109 wherein the carrier-conduction layer is a metal oxide thin film.

111. (Original) The method of claim 110 wherein the metal oxide thin film is a ZnO thin film.

112. (Original) The method of claim 109 wherein the carrier-conduction layer is a metal-based oxide alloy thin film.

113. (Original) The method of claim 112 wherein the metal-based oxide alloy thin film is a ZnO based alloy thin film.

114. (Original) The method of claim 109 wherein the carrier-conduction layer is a p-type metal oxide thin film.

115. (Original) The method of claim 114 wherein the p-type metal oxide thin film is a p-type ZnO thin film.

116. (Original) The method of claim 109 wherein the bilayered ohmic contacts adhered to the at least one contact site of the carrier-conduction layer and the exposed surface of the substrate layer comprise two metallic elements selected from a group of

metallic elements consisting of Be, Al, Ti, Cr, Fe, Co, Ni, Cu, Zn, Rh, Pd, Ag, In, Te, Ta, W, Ir, Pt, and Au.

117. (Original) The method of claim 109 further comprising the step of:

(f) annealing the semiconductor device at a predetermined annealing temperature for a predetermined annealing period in a gaseous environment.